The documentation and process conversion measures necessary to comply with this revision shall be completed by 5 September 2009.

INCH-POUND

MIL-PRF-19500/516E
5 June 2009
SUPERSEDING
MIL-PRF-19500/516D
23 July 1999

* PERFORMANCE SPECIFICATION SHEET

# SEMICONDUCTOR DEVICE, DIODE SILICON, BIPOLAR TRANSIENT VOLTAGE SUPPRESSOR, TYPES 1N6102 THROUGH 1N6137, 1N6102A THROUGH 1N6137A, 1N6138 THROUGH 1N6173, 1N6138A THROUGH 1N6173A, 1N6102US THROUGH 1N6137US, 1N6102AUS THROUGH 1N6137AUS, 1N6138US THROUGH 1N6173US, 1N6138AUS THROUGH 1N6173AUS, JAN, JANTX, JANTXV, JANHC, JANKC, AND JANS

This specification is approved for use by all Departments and Agencies of the Department of Defense.

* The requirements for acquiring the product described herein shall consist of this specification sheet and MIL-PRF-19500.

## 1. SCOPE

1.1 Scope. This specification covers the performance requirements for bipolar 500 watt and 1,500 watt peak pulse power transient voltage suppressor diodes. Four levels of product assurance are provided for each device type as specified in MIL-PRF-19500. Two levels of product assurance are provided for die. The suffix "A" denotes a five percent voltage tolerance.

1.2 Physical dimensions. See figure 1, figure 2 (surface mount), and figures 3 and 4 (die) herein.

1.3 Maximum ratings. Maximum ratings are as shown in columns 4, 6, and 7 of the electrical characteristics table herein and as follows:

a. $P_R$ = 2 W (for 500 W peak pulse power devices) and 3 W (for 1,500 W peak pulse power devices) at $T_A$ = +25°C (see figure 5 for derating).

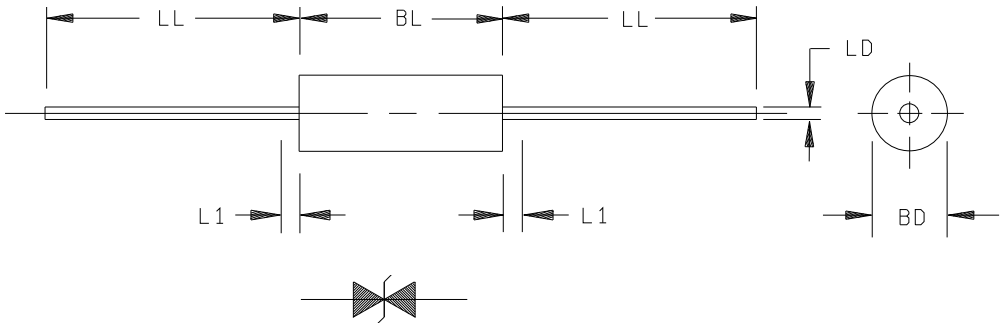
b. $P_R$ = 3 W (for 500 W peak pulse power devices) and 5 W (for 1,500 W peak pulse power devices) at $T_L$ = +75°C for L = 0.375 inch (9.53 mm) (see figure 6).

c. $P_{PR}$ =500 W (1N6102 through 1N6137 (including A and US suffix versions)) and 1,500 W (1N6138 through 1N6173 (including A and US suffix versions)) at $t_p$ = 1 ms (see figure 7).

d. -55°C ≤ $T_{OP}$ ≤ +175°C, -55°C ≤ $T_{STG}$ ≤ +175°C (ambient temperatures).

1.4 Primary electrical characteristics. Primary electrical characteristics are as shown in columns 2 and 4 of the electrical characteristics table herein.

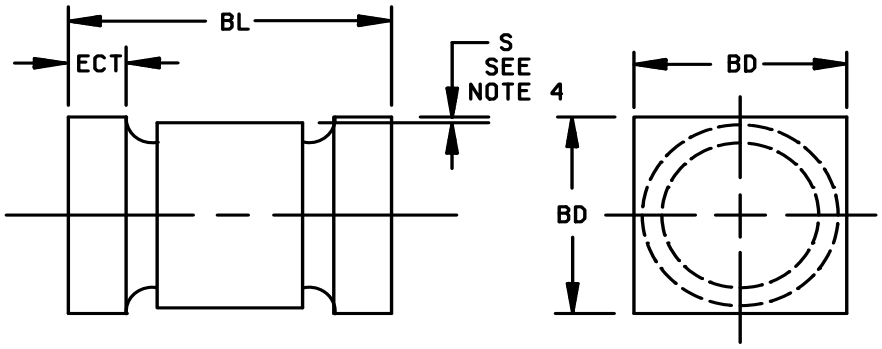
* Comments, suggestions, or questions on this document should be addressed to Defense Supply Center, Columbus, ATTN: DSCC-VAC, P.O. Box 3990, Columbus, OH 43218-3990, or emailed to semiconductor@dscc.dla.mil . Since contact information can change, you may want to verify the currency of this address information using the ASSIST Online database at http://assist.daps.dla.mil .




| Ltr | Dimensions | | | | | | | | Notes |
|---|---|---|---|---|---|---|---|---|---|
| | 1N6102 through 1N6137<br>1N6102A through 1N6137A | | | | 1N6138 through 1N6173<br>1N6138A through 1N 6173A | | | | |
| | Inches | | Millimeters | | Inches | | Millimeters | | |
| | Min | Max | Min | Max | Min | Max | Min | Max | |
| BD | .085 | .140 | 2.16 | 3.56 | .135 | .185 | 3.43 | 4.70 | 3 |
| BL | .140 | .185 | 3.56 | 4.70 | .140 | .195 | 3.56 | 4.95 | |
| LD | .026 | .033 | 0.66 | 0.84 | .036 | .042 | 0.91 | 1.07 | |
| LL | 1.00 | 1.30 | 25.4 | 33.02 | 1.00 | 1.30 | 25.4 | 33.02 | |
| L1 | | .030 | | 0.76 | | .030 | | 0.76 | 4 |

NOTES:
1. Dimensions are in inches.
2. Millimeters are given for general information only.
3. Dimension BD shall be measured at the largest diameter.
4. Dimension L1 lead diameter uncontrolled in this area.
5. In accordance with ASME Y14.5M, diameters are equivalent to Φx symbology.

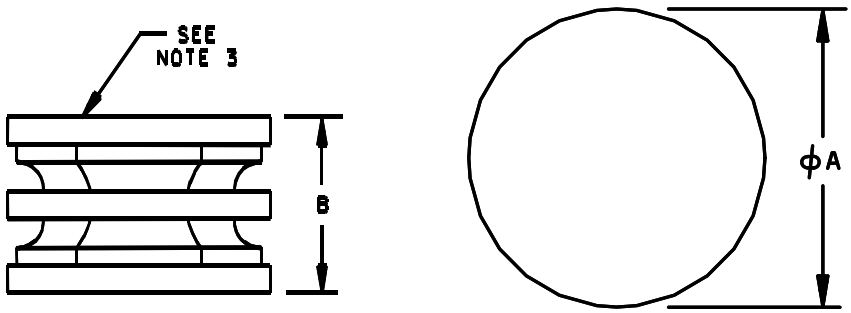
* FIGURE 1. Semiconductor device, diode, types 1N6102 through 1N6173 and 1N6102A through 1N6173A.




| Ltr | Dimensions | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 1N6102US through 1N6137US, 1N6102AUS through 1N6137AUS | | | | 1N6138US through 1N6173US 1N6138AUS through 1N6173AUS | | | |
| | Inches | | Millimeters | | Inches | | Millimeters | |
| | Min | Max | Min | Max | Mini | Max | Min | Max |
| BD | .137 | .148 | 3.48 | 3.76 | .183 | .202 | 4.65 | 5.13 |
| BL | .200 | .225 | 5.08 | 5.72 | .205 | .245 | 5.21 | 6.22 |
| ECT | .019 | .028 | 0.48 | 0.71 | .019 | .028 | 0.48 | 0.71 |
| S | .003 | | 0.08 | | .003 | | 0.08 | |

NOTES:
1. Dimensions are in inches.
2. Millimeters are given for general information only.
3. Minimum clearance of glass body to mounting surface on all orientations.
4. In accordance with ASME Y14.5M, diameters are equivalent to Φx symbology.

FIGURE 2. Semiconductor device, diode 1N6102US through 1N6173US, 1N6102AUS through 1N6173AUS.

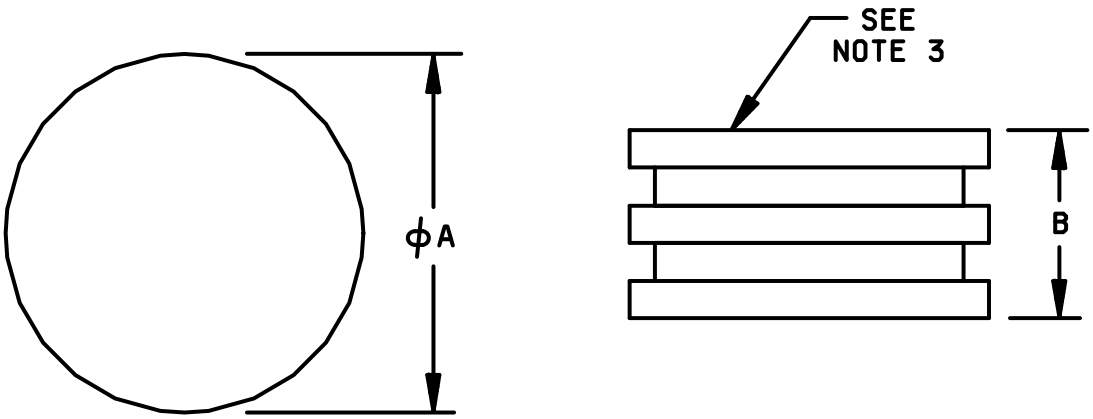



**A - version**

| Dimensions | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Ltr | 1N6102 through 1N6137<br>1N6102A through 1N6137A | | | | 1N6138 through 1N6173<br>1N6138A through 1N6173A | | | |
| | Inches | | Millimeters | | Inches | | Millimeters | |
| | Min | Max | Min | Max | Min | Max | Min | Max |
| ΦA | .087 | .093 | 2.21 | 2.36 | .124 | .130 | 3.15 | 3.30 |
| B | .030 | .040 | 0.76 | 1.02 | .030 | .040 | 0.76 | 1.02 |

NOTES:
1. Dimensions are in inches.
2. Millimeters are for general information only.
3. Silver plate 250 microinches nominal on all surfaces of three discs.
4. In accordance with ASME Y14.5M, diameters are equivalent to Φx symbology.

FIGURE 3. Physical dimensions, JANHC and JANKC die (A-version), 1N6102 through 1N6173, 1N6102A through 1N6173A.




**B - version**

| Dimensions | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Ltr | 1N6103 through 1N6137<br>1N6103A through 1N6137A | | | | 1N6138 through 1N6173<br>1N6138A through 1N6173A | | | |
| | Inches | | Millimeters | | Inches | | Millimeters | |
| | Min | Max | Min | Max | Min | Max | Min | Max |
| ΦA | .087 | .093 | 2.21 | 2.36 | .123 | .128 | 3.12 | 3.25 |
| B | .110 | .120 | 2.79 | 3.05 | .110 | .120 | 2.79 | 3.05 |

NOTES:
1. Dimensions are in inches.
2. Millimeters are for general information only.
3. Silver thickness 120 microinches nominal on all discs.
4. In accordance with ASME Y14.5M, diameters are equivalent to Φx symbology.

FIGURE 4. Physical dimensions, JANHC and JANKC die (B-version), 1N6102 through 1N6173, 1N6102A through 1N6173A.

## 2. APPLICABLE DOCUMENTS

* 2.1 General. The documents listed in this section are specified in sections 3, 4, or 5 of this specification. This section does not include documents cited in other sections of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements of documents cited in sections 3, 4, or 5 of this specification, whether or not they are listed.

2.2 Government documents.

* 2.2.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

DEPARTMENT OF DEFENSE SPECIFICATION

MIL-PRF-19500 - Semiconductor Devices, General Specification for.

DEPARTMENT OF DEFENSE STANDARDS

MIL-STD-750 - Test Methods for Semiconductor Devices.

* (Copies of these documents are available online at http://assist.daps.dla.mil/quicksearch/ or http://assist.daps.dla.mil or from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

* 2.3 Order of precedence. Unless otherwise noted herein or in the contract, in the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

## 3. REQUIREMENTS

* 3.1 General. The individual item requirements shall be as specified in MIL-PRF-19500 and as modified herein.

3.2 Qualification. Devices furnished under this specification shall be products that are manufactured by a manufacturer authorized by the qualifying activity for listing on the applicable qualified manufacturers list before contract award (see 4.2 and 6.3).

3.3 Abbreviations, symbols, and definitions. Abbreviations, symbols, and definitions used herein shall be as specified in MIL-PRF-19500 and as follows.

| | |
|---|---|
| $I_{(BR)}$ | Reverse breakdown current at the specified condition. |
| $P_{PR}$ | Reverse peak pulse power. |
| $V_C(max)$ | Maximum clamping voltage. The maximum peak voltage appearing across the device when subjected to the peak pulse current $I_P$. |
| $\alpha V_{(BR)}$ | Temperature coefficient of $V_{(BR)}$. |

3.4 Interface and physical dimensions. Interface and physical dimensions shall be as specified in MIL-PRF-19500 and herein.

* 3.4.1 Metallurgical bond construction. Devices shall be metallurgically bonded, thermally matched, non-cavity, double-plug construction in accordance with the requirements of category I (see MIL-PRF-19500), and herein. The "US" version shall be structurally identical to the axial lead type except for lead configuration.

3.4.2 Lead finish. Lead finish shall be solderable in accordance with MIL-PRF-19500, MIL-STD-750, and herein. Where a choice of lead finish is desired, it shall be specified in the acquisition document (see 6.2).

* 3.5 Marking. Marking shall be in accordance with MIL-PRF-19500. The part number may be reduced to J610X, JX610X, JV610X or JS610X. Polarity marking is not required.

3.5.1 Marking of US version devices. For US version devices only, all marking may be omitted from the body, but shall be retained on the initial container.

3.6 Electrical performance characteristics. Unless otherwise specified herein, the electrical performance characteristics are as specified in 1.3, 1.4, table I, and table II.

3.7 Electrical test requirements. The electrical test requirements shall be the subgroups specified in tables I and II.

* 3.8 Workmanship. Semiconductor devices shall be processed in such a manner as to be uniform in quality and shall be free from other defects that will affect life, serviceability, or appearance.

4. VERIFICATION

4.1 Classification of Inspections. The inspection requirements specified herein are classified as follows:

a. Qualification inspection (see 4.2).

b. Screening (see 4.3)

c. Conformance inspection (see 4.4).

4.2 Qualification inspection. Qualification inspection shall be in accordance with MIL-PRF-19500. A separate qualification shall be required for the 500-watt and 1,500-watt peak pulse power device, respectively.

4.2.1 JANHC and JANKC die. JANHC and JANKC die shall be qualified in accordance with MIL-PRF-19500.

* 4.2.2 Group E qualification. Group E inspection shall be performed for qualification or re-qualification only. In case qualification was awarded to a prior revision of the specification sheet that did not require the performance of table III tests, the tests specified in table III herein that were not performed in the prior revision shall be performed on the first inspection lot of this revision to maintain qualification.

* 4.3 Screening (JANS, JANTX, and JANTXV levels only). Screening shall be in accordance with table E-IV of MIL-PRF-19500, and as specified herein. The following measurements shall be made in accordance with table I herein. Devices that exceed the limits of table I herein shall not be acceptable.

| Screen (see table E-IV of MIL-PRF-19500) | Measurement | |
|---|---|---|
| | JANS level | JANTX and JANTXV levels |
| 5 | Not applicable | Not applicable |
| 9, 10, 11 | Not applicable | Not applicable |
| 12 | See 4.5.1 | See 4.5.1 |
| 13 | Interim electrical, delta, and group A, subgroup 2, electrical parameters not applicable for this screen (performed in screen 12). | Interim electrical, delta, and group A, subgroup 2, electrical parameters not applicable for this screen (performed in screen 12). |

4.3.1 Screening (JANHC and JANKC die). Screening of JANHC and JANKC die shall be in accordance with MIL-PRF-19500. As a minimum, die shall be 100-percent probed in accordance with table I, subgroup 2 herein.

4.4 Conformance inspection. Conformance inspection shall be in accordance with MIL-PRF-19500, and as specified herein. A separate quality conformance inspection shall be required for the 500-watt and 1,500-watt peak pulse power devices, respectively.

4.4.1 Group A inspection. Group A inspection shall be conducted in accordance with MIL-PRF-19500 and table I herein.

4.4.2 Group B inspection. Group B inspection shall be conducted in accordance with the conditions specified for subgroup testing in table E-VIa (JANS) and table E-VIb (JAN, JANTX, and JANTXV) of MIL-PRF-19500, and as follows. Electrical measurements (end-points) and delta requirements shall be performed twice (once in each direction), in accordance with table I, subgroup 2 herein.

* 4.4.2.1 Group B inspection, table E-VIa (JANS) of MIL-PRF-19500.

| Subgroup | Method | Condition |
|---|---|---|
| B4 | | Not applicable. |
| B5 | 1027 | See 4.5.1. |

* 4.4.2.2 Group B inspection, table E-VIb (JAN, JANTX, and JANTXV) of MIL-PRF-19500.

| Subgroup | Method | Condition |
|---|---|---|
| B3 | 1027 | See 4.5.1. |
| B5 | | Not applicable. |
| B6 | | Delta limits: $\Delta I_{R1} \leq$ 100 percent of initial reading or 20 percent of column 5 of table II, whichever is greater; $\Delta V_{(BR)} \leq$ 5 percent of initial value. |

4.4.3 Group C inspection. Group C inspection shall be conducted in accordance with the conditions specified for subgroup testing in table E-VII of MIL-PRF-19500, and as follows. Electrical measurements (end-points) shall be performed twice (once in each direction), in accordance with table I, subgroup 2 herein.

| Subgroup | Method | Condition |
|---|---|---|
| C2 | 2036 | Lead tension: Test condition A, weight = 5 pounds, t = 15 ±3 seconds. Lead fatigue: Test condition E, weight = 2 pounds (not applicable to US suffix devices). |
| C6 | 1026 | See 4.5.1 and 4.5.3. |
| C7 | 4071 | $I_{(BR)}$ = column 3 of table II, $T_1$ = +25°C ±3°C, $T_2 = T_1$ +100°C; sampling plan shall be 45 devices, c = 0; $\alpha V_{(BR)}$ = column 8 of table II. |

* 4.4.4 Group E inspection. Group E inspection shall be conducted in accordance with the conditions specified for subgroup testing in appendix E, table E-IX of MIL-PRF-19500 and as specified herein. Electrical measurements (end-points) shall be in accordance with table I, subgroup 2 herein.

4.5 Methods of inspection. Methods of inspection shall be as specified in the appropriate tables and as follows.

4.5.1 Power burn-in and steady-state operation life test conditions. For the purposes of this test, the direction in which the device is first pulsed shall be considered polarity A and the reverse direction polarity B. The test conditions and order of events shall be as follows:

a. Pulse in accordance with 4.5.3, in polarity A 5 times (screening and group B) and 50 times (group C) at $T_A$ = +25°C.

b. Pulse in accordance with 4.5.3, in polarity B 5 times (screening and group B) and 50 times (group C) at $T_A$ = +25°C.

c. Read and record $I_{R1}$ and $V_{(BR)1}$ in polarities A and B at $T_A$ = +25°C, remove defective devices and record number of failures.

d. Apply the working peak reverse voltage ($V_{RWM}$) (column 4 of table II) in polarity A at $T_A$ = +125°C as follows:

(1) For 48 hours (JANTX and JANTXV) and 120 hours (JANS) for the screening test.

(2) For 170 hours (JAN, JANTX, and JANTXV) for group B steady-state operation life test.

(3) For 500 hours for group C steady-state operation life test.

e. Read $I_{R1}$ in polarity A at $T_A$ = +25°C. Devices with $\Delta I_{R1}$ > 50 percent (100 percent for steady-state operation life) of the initial reading or 20 percent of column 5 of table II, whichever is greater, shall be considered defective. Remove defective devices and record the number of failures.

f. Apply the working peak pulse reverse voltage ($V_{RWM}$) (column 4 of table II) in polarity B at $T_A$ = +125°C as follows:

(1) 48 hours (JANTX and JANTXV) and 120 hours (JANS) for the screening test.

(2) 170 hours (JAN, JANTX, and JANTXV) for group B steady-state operation life test.

(3) 500 hours for group C steady-state operation life test.

g. Read $I_{R1}$ in polarity B at $T_A$ = +25°C. Devices with $\Delta I_{R1}$ > 50 percent (100 percent for steady-state operation life) of the initial reading or 20 percent of column 5 of table II, whichever is greater, shall be considered defective. Remove defective devices and record the number of failures.

h. Read $V_{(BR)1}$ in polarities A and B at $T_A$ = +25°C. Devices with $\Delta V_{BR1}$ > ±2 percent (±5 percent for steady-state operation life) of the initial reading shall be considered defective. Remove defective devices and record the number of failures.

i. Read $I_{R1}$ in polarity A at $T_A$ = +25°C, remove defective devices and record the number of failures.

4.5.1.1 Group C steady-state operation life test (alternate procedure). When the group B 340-hour life test is continued on test to 1,000 hours to satisfy the group C life test requirements, the test shall be performed as given in 4.5.1 with the following exceptions:

a. In 4.5.1, steps a and b shall be moved and performed following step g.

b. In 4.5.1, steps e and g shall be repeated after steps a and b are performed and before step h is completed (step i may be omitted when this procedure is used).

4.5.2 Accelerated steady-state operation life. This test shall be conducted with the devices subjected to the breakdown current specified in column 3 of table II in opposite polarities for 48 +8, -4 hours in each polarity. At the beginning of the test and at the end of each time period, the devices shall be temperature stabilized at $T_A$ = +25°C and subjected to pulse conditions at the rate of one pulse per minute (max) for ten pulses each, in accordance with 4.5.3 as specified.

4.5.3 Maximum peak pulse current ($I_P$). The peak pulse currents specified in column 7 of table II shall be applied simultaneously maintaining a bias voltage, not less than the applicable voltage in column 4 of table II, in the same polarity as the peak pulse current. The peak pulse current shall be applied with a current versus time waveform (1 pulse per minute maximum) such that the pulse current shall reach 100 percent of $I_P$ at $t \leq 10$ μs and decay to 50 percent of $I_P$ at $t \geq 1$ ms for $t_p$ = 1 ms (see figure 8). NOTE: Tolerance on time (t) shall be +10 -0 percent.

4.5.4 Clamping voltage. The peak pulse clamping voltage shall be measured across the diode in a 1 ms time interval. The response detector shall demonstrate equipment accuracy of ±3 percent.

TABLE I. Group A inspection.

| Inspection 1/ | MIL-STD-750 | | Symbol | Limit | | Unit |
|---|---|---|---|---|---|---|
| | Method | Conditions | | Min | Max | |
| Subgroup 1 | | | | | | |
| Visual and mechanical examination | 2071 | | | | | |
| Subgroup 2 2/ | | | | | | |
| Reverse current leakage | 4016 | DC method, $V_R = V_{RWM}$ (column 4 of table II herein.) | $I_{R1}$ | | Column 5 of table II | μA dc |
| Breakdown voltage | 4022 | $t_p \leq 300$ ms, duty cycle $\leq 2$ percent $I_{(BR)}$ = column 3 of table II | $V_{(BR)1}$ | Column 2 of table II | | V dc |
| Subgroup 3 2/ | | | | | | |
| High temperature operation | | $T_A$ = +150°C | | | | |
| Reverse current leakage | 4016 | DC method, $V_R = V_{RWM}$ (column 4 of table II herein.) | $I_{R2}$ | | Column 9 of table II | μA dc |
| Subgroup 4 2/ | | | | | | |
| Clamping voltage maximum (pulsed) | | $t_p$ = 1 ms (see 4.5.3 and 4.5.4), $I_p$ = column 7 of table II. | $V_{C(MAX)}$ | | Column 6 of table II | V (pk) |
| Subgroups 5 and 6 | | | | | | |
| Not applicable | | | | | | |

1/ For sampling plan, see MIL-PRF-19500.
2/ All electrical testing shall be performed twice, once in each direction.

TABLE II. Electrical characteristics (for 500 W and 1,500 W series diodes limits apply in both directions).

| Column 1 | | Column 2 | Column 3 | Column 4 | Column 5 | | Column 6 | Column 7 | | Column 8 | Column 9 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Series type | | Breakdown voltage $V_{(BR)1}$ at $I_{(BR)}$ | Test current $I_{(BR)}$ | Working peak reverse voltage $V_{RWM}$ | Maximum reverse current $I_{R1}$ | | Maximum clamping voltage $V_C$ (max) at $I_p$ $t_p$ = 1 ms | Maximum peak pulse current $I_P$ | | Maximum temp. Coeff. of $V_{(BR)}$ $\alpha V_{(BR)}$ | Maximum reverse current at $T_A$ = +150°C $I_{R2}$ | |
| 500 W | 1,500 W | Min V dc 1/ | mA dc 1/ | V dc 1/ | µA dc 2/ | µA dc 3/ | V (pk) 1/ | A (pk) 2/ | A (pk) 3/ | %/°C 1/ | µA dc 2/ | µA dc 3/ |
| 1N6102 | 1N6138 | 6.12 | 175 | 5.2 | 100 | 500 | 11.0 | 45.4 | 136.4 | .05 | 4,000 | 12,000 |
| 1N6102A | 1N6138A | 6.46 | 175 | 5.2 | 100 | 500 | 10.5 | 47.6 | 142.8 | .05 | 4,000 | 12,000 |
| 1N6103 | 1N6139 | 6.75 | 175 | 5.7 | 50 | 300 | 11.8 | 42.4 | 127.1 | .06 | 750 | 3,000 |
| 1N6103A | 1N6139A | 7.13 | 175 | 5.7 | 50 | 300 | 11.2 | 44.6 | 133.9 | .06 | 750 | 3,000 |
| 1N6104 | 1N6140 | 7.38 | 150 | 6.2 | 20 | 100 | 12.7 | 39.4 | 118.1 | .06 | 500 | 2,000 |
| 1N6104A | 1N6140A | 7.79 | 150 | 6.2 | 20 | 100 | 12.1 | 41.3 | 124.0 | .06 | 500 | 2,000 |
| 1N6105 | 1N6141 | 8.19 | 150 | 6.9 | 20 | 100 | 14.0 | 35.7 | 107.1 | .06 | 300 | 1,200 |
| 1N6105A | 1N6141A | 8.65 | 150 | 6.9 | 20 | 100 | 13.4 | 37.3 | 111.9 | .06 | 300 | 1,200 |
| 1N6106 | 1N6142 | 9.00 | 125 | 7.6 | 20 | 100 | 15.2 | 32.9 | 98.7 | .07 | 200 | 800 |
| 1N6106A | 1N6142A | 9.50 | 125 | 7.6 | 20 | 100 | 14.5 | 34.5 | 103.4 | .07 | 200 | 800 |
| 1N6107 | 1N6143 | 9.90 | 125 | 8.4 | 20 | 20 | 16.3 | 30.7 | 92.0 | .07 | 200 | 800 |
| 1N6107A | 1N6143A | 10.45 | 125 | 8.4 | 20 | 20 | 15.6 | 32.0 | 96.2 | .07 | 200 | 800 |
| 1N6108 | 1N6144 | 10.80 | 100 | 9.1 | 20 | 20 | 17.7 | 28.2 | 84.7 | .07 | 150 | 600 |
| 1N6108A | 1N6144A | 11.40 | 100 | 9.1 | 20 | 20 | 16.9 | 29.6 | 88.8 | .07 | 150 | 600 |
| 1N6109 | 1N6145 | 11.70 | 100 | 9.9 | 20 | 20 | 19.0 | 26.3 | 78.9 | .08 | 150 | 600 |
| 1N6109A | 1N6145A | 12.35 | 100 | 9.9 | 20 | 20 | 18.2 | 27.5 | 82.4 | .08 | 150 | 600 |
| 1N6110 | 1N6146 | 13.50 | 75 | 11.4 | 20 | 20 | 21.9 | 22.8 | 68.5 | .08 | 100 | 400 |
| 1N6110A | 1N6146A | 14.25 | 75 | 11.4 | 20 | 20 | 21.0 | 23.8 | 71.4 | .08 | 100 | 400 |
| 1N6111 | 1N6147 | 14.40 | 75 | 12.2 | 20 | 20 | 23.4 | 21.4 | 64.1 | .08 | 100 | 400 |
| 1N6111A | 1N6147A | 15.20 | 75 | 12.2 | 20 | 20 | 22.3 | 22.4 | 67.3 | .08 | 100 | 400 |
| 1N6112 | 1N6148 | 16.20 | 65 | 13.7 | 1 | 10 | 26.3 | 19.0 | 57.0 | .085 | 100 | 400 |
| 1N6112A | 1N6148A | 17.10 | 65 | 13.7 | 1 | 10 | 25.1 | 19.9 | 59.8 | .085 | 100 | 400 |
| 1N6113 | 1N6149 | 18.00 | 65 | 15.2 | 1 | 5 | 29.0 | 17.2 | 51.7 | .085 | 100 | 400 |
| 1N6113A | 1N6149A | 19.00 | 65 | 15.2 | 1 | 5 | 27.7 | 18.0 | 54.2 | .085 | 100 | 400 |
| 1N6114 | 1N6150 | 19.8 | 50 | 16.7 | 1 | 5 | 31.9 | 15.7 | 47.0 | .085 | 100 | 400 |
| 1N6114A | 1N6150A | 20.9 | 50 | 16.7 | 1 | 5 | 30.5 | 16.4 | 49.2 | .085 | 100 | 400 |
| 1N6115 | 1N6151 | 21.6 | 50 | 18.2 | 1 | 5 | 34.8 | 14.4 | 43.1 | .09 | 100 | 400 |
| 1N6115A | 1N6151A | 22.8 | 50 | 18.2 | 1 | 5 | 33.3 | 15.0 | 45.0 | .09 | 100 | 400 |
| 1N6116 | 1N6152 | 24.3 | 50 | 20.6 | 1 | 5 | 39.2 | 12.8 | 38.3 | .09 | 100 | 400 |
| 1N6116A | 1N6152A | 25.7 | 50 | 20.6 | 1 | 5 | 37.4 | 13.4 | 40.1 | .09 | 100 | 400 |

See footnotes at end of table.

TABLE II. Electrical characteristics for 500 W and 1,500 W series diodes (limits apply in both directions) - Continued.

| Column 1 | | Column 2 | Column 3 | Column 4 | Column 5 | | Column 6 | Column 7 | | Column 8 | Column 9 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Series type | | Breakdown voltage $V_{(BR)1}$ at $I_{(BR)}$ | Test current $I_{(BR)}$ | Working peak reverse voltage $V_{RWM}$ | Maximum reverse current $I_{R1}$ | | Maximum clamping voltage $V_C$ (max) at $I_p$ $t_p$ = 1 ms | Maximum peak pulse current $I_P$ | | Maximum temp. Coeff. of $V_{(BR)}$ $\alpha V_{(BR)}$ | Maximum reverse current at $T_A$ = +150°C $I_{R2}$ | |
| 500 W | 1,500 W | Min V dc 1/ | mA dc 1/ | V dc 1/ | µA dc 2/ | µA dc 3/ | V (pk) 1/ | A (pk) 2/ | A (pk) 3/ | %/°C 1/ | µA dc 2/ | µA dc 3/ |
| 1N6117 | 1N6153 | 27.0 | 40 | 22.8 | 1 | 5 | 43.6 | 11.5 | 34.4 | .09 | 100 | 400 |
| 1N6117A | 1N6153A | 28.5 | 40 | 22.8 | 1 | 5 | 41.6 | 12.0 | 36.0 | .09 | 100 | 400 |
| 1N6118 | 1N6154 | 29.7 | 40 | 25.1 | 1 | 5 | 47.9 | 10.4 | 31.3 | .095 | 100 | 400 |
| 1N6118A | 1N6154A | 31.4 | 40 | 25.1 | 1 | 5 | 45.7 | 10.9 | 32.8 | .095 | 100 | 400 |
| 1N6119 | 1N6155 | 32.4 | 30 | 27.4 | 1 | 5 | 52.3 | 9.6 | 28.7 | .095 | 100 | 400 |
| 1N6119A | 1N6155A | 34.2 | 30 | 27.4 | 1 | 5 | 49.9 | 10.0 | 30.1 | .095 | 100 | 400 |
| 1N6120 | 1N6156 | 35.1 | 30 | 29.7 | 1 | 5 | 56.2 | 8.9 | 26.7 | .095 | 100 | 400 |
| 1N6120A | 1N6156A | 37.1 | 30 | 29.7 | 1 | 5 | 53.6 | 9.3 | 28.0 | .095 | 100 | 400 |
| 1N6121 | 1N6157 | 38.7 | 30 | 32.7 | 1 | 5 | 62.0 | 8.1 | 24.2 | .095 | 100 | 400 |
| 1N6121A | 1N6157A | 40.9 | 30 | 32.7 | 1 | 5 | 59.1 | 8.5 | 25.4 | .095 | 100 | 400 |
| 1N6122 | 1N6158 | 42.3 | 25 | 35.8 | 1 | 5 | 67.7 | 7.4 | 22.2 | .095 | 100 | 400 |
| 1N6122A | 1N6158A | 44.7 | 25 | 35.8 | 1 | 5 | 64.6 | 7.7 | 23.2 | .095 | 100 | 400 |
| 1N6123 | 1N6159 | 45.9 | 25 | 38.8 | 1 | 5 | 73.5 | 6.8 | 20.4 | .095 | 100 | 400 |
| 1N6123A | 1N6159A | 48.5 | 25 | 38.8 | 1 | 5 | 70.1 | 7.1 | 21.4 | .095 | 100 | 400 |
| 1N6124 | 1N6160 | 50.4 | 20 | 42.6 | 1 | 5 | 80.7 | 6.2 | 18.6 | .095 | 100 | 400 |
| 1N6124A | 1N6160A | 53.2 | 20 | 42.6 | 1 | 5 | 77.0 | 6.5 | 19.5 | .095 | 100 | 400 |
| 1N6125 | 1N6161 | 55.8 | 20 | 47.1 | 1 | 5 | 89.3 | 5.6 | 16.8 | .100 | 100 | 400 |
| 1N6125A | 1N6161A | 58.9 | 20 | 47.1 | 1 | 5 | 85.3 | 5.9 | 17.6 | .100 | 100 | 400 |
| 1N6126 | 1N6162 | 61.2 | 20 | 51.7 | 1 | 5 | 98.0 | 5.1 | 15.3 | .100 | 100 | 400 |
| 1N6126A | 1N6162A | 64.6 | 20 | 51.7 | 1 | 5 | 97.1 | 5.1 | 15.4 | .100 | 100 | 400 |
| 1N6127 | 1N6163 | 67.5 | 20 | 56.0 | 1 | 5 | 108.1 | 4.6 | 13.9 | .100 | 100 | 400 |
| 1N6127A | 1N6163A | 71.3 | 20 | 56.0 | 1 | 5 | 103.1 | 4.8 | 14.5 | .100 | 100 | 400 |
| 1N6128 | 1N6164 | 73.8 | 15 | 62.2 | 1 | 5 | 118.2 | 4.2 | 12.7 | .100 | 100 | 400 |
| 1N6128A | 1N6164A | 77.9 | 15 | 62.2 | 1 | 5 | 112.8 | 4.4 | 13.3 | .100 | 100 | 400 |
| 1N6129 | 1N6165 | 81.9 | 15 | 69.2 | 1 | 5 | 131.1 | 3.8 | 11.4 | .100 | 100 | 400 |
| 1N6129A | 1N6165A | 86.5 | 15 | 69.2 | 1 | 5 | 125.1 | 4.0 | 12.0 | .100 | 100 | 400 |
| 1N6130 | 1N6166 | 90.0 | 12 | 76.0 | 1 | 5 | 144.1 | 3.5 | 10.4 | .100 | 100 | 400 |
| 1N6130A | 1N6166A | 95.0 | 12 | 76.0 | 1 | 5 | 137.6 | 3.6 | 10.9 | .100 | 100 | 400 |
| 1N6131 | 1N6167 | 99.0 | 12 | 83.6 | 1 | 5 | 158.5 | 3.2 | 9.5 | .100 | 100 | 400 |
| 1N6131A | 1N6167A | 104.5 | 12 | 83.6 | 1 | 5 | 151.3 | 3.3 | 9.9 | .100 | 100 | 400 |

See footnotes at end of table.

TABLE II. Electrical characteristics for 500 W and 1,500 W series diodes (limits apply in both directions) - Continued.

| Column 1 | | Column 2 | Column 3 | Column 4 | Column 5 | | Column 6 | Column 7 | | Column 8 | Column 9 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Series type | | Breakdown voltage $V_{(BR)1}$ at $I_{(BR)}$ | Test current $I_{(BR)}$ | Working peak reverse voltage $V_{RWM}$ | Maximum reverse current $I_{R1}$ | | Maximum clamping voltage $V_C$ (max) at $I_p$ $t_p$ = 1 ms | Maximum peak pulse current $I_P$ | | Maximum temp. Coeff. of $V_{(BR)}$ $\alpha V_{(BR)}$ | Maximum reverse current at $T_A$ = +150°C $I_{R2}$ | |
| 500 W | 1,500 W | Min V dc 1/ | mA dc 1/ | V dc 1/ | µA dc 2/ | µA dc 3/ | V (pk) 1/ | A (pk) 2/ | A (pk) 3/ | %/°C 1/ | µA dc 2/ | µA dc 3/ |
| 1N6132 | 1N6168 | 108.0 | 10 | 91.2 | 1 | 5 | 172.9 | 2.9 | 8.7 | .100 | 100 | 400 |
| 1N6132A | 1N6168A | 114.0 | 10 | 91.2 | 1 | 5 | 165.1 | 3.0 | 9.1 | .100 | 100 | 400 |
| 1N6133 | 1N6169 | 117.0 | 10 | 98.8 | 1 | 5 | 187.3 | 2.7 | 8.0 | .105 | 100 | 400 |
| 1N6133A | 1N6169A | 123.5 | 10 | 98.8 | 1 | 5 | 178.8 | 2.8 | 8.4 | .105 | 100 | 400 |
| 1N6134 | 1N6170 | 135.0 | 8 | 114.0 | 1 | 5 | 216.2 | 2.3 | 6.9 | .105 | 100 | 400 |
| 1N6134A | 1N6170A | 142.5 | 8 | 114.0 | 1 | 5 | 206.3 | 2.4 | 7.3 | .105 | 100 | 400 |
| 1N6135 | 1N6171 | 144 | 8 | 121.6 | 1 | 5 | 228.8 | 2.2 | 6.6 | .105 | 100 | 400 |
| 1N6135A | 1N6171A | 152 | 8 | 121.6 | 1 | 5 | 218.4 | 2.3 | 6.9 | .105 | 100 | 400 |
| 1N6136 | 1N6172 | 162 | 5 | 136.8 | 1 | 5 | 257.4 | 1.9 | 5.8 | .110 | 100 | 400 |
| 1N6136A | 1N6172A | 171 | 5 | 136.8 | 1 | 5 | 245.7 | 2.0 | 6.1 | .110 | 100 | 400 |
| 1N6137 | 1N6173 | 180 | 5 | 152.0 | 1 | 5 | 286.0 | 1.7 | 5.2 | .110 | 100 | 400 |
| 1N6137A | 1N6173A | 190 | 5 | 152.0 | 1 | 5 | 273.0 | 1.8 | 5.5 | .110 | 100 | 400 |

1/ Applies to both 500 W and 1,500 W series.
2/ Applies to only 500 W series.
3/ Applies to only 1,500 W series.

* TABLE III. Group E inspection (all quality levels) for qualification only.

| Inspection | MIL-STD-750 | | Sampling plan |
|---|---|---|---|
| | Method | Conditions | |
| Subgroup 1 | | | n = 45, c = 0 |
| Temperature cycling | 1051 | 500 cycles, condition C, -55°C to +175°C. | |
| Electrical measurements | | See table I, subgroup 2. | |
| Subgroup 2 | | | n = 22, c = 0 |
| Life test | | 1,000 hours. See 4.3.1. | |
| Electrical measurements | | See table I, subgroup 2. | |
| Subgroup 3 | | | n = 3, c =0 |
| DPA | 2101 | | |
| Subgroups 4, 5, and 6 | | | |
| Not applicable | | | |
| Subgroup 7 | | | n = 45, c = 0 |
| Soldering heat | 2031 | | |
| Subgroup 8 | | | |
| Peak pulse current | | See 4.5.3. $I_{PP}$ shall be characterized by the supplier and this data shall be available to the Government. Test shall be performed on each low and high voltage device for each structurally identical grouping. Test to failure. (See figure 9.) | |
| Electrical measurements | | See table I, subgroup 2. | |

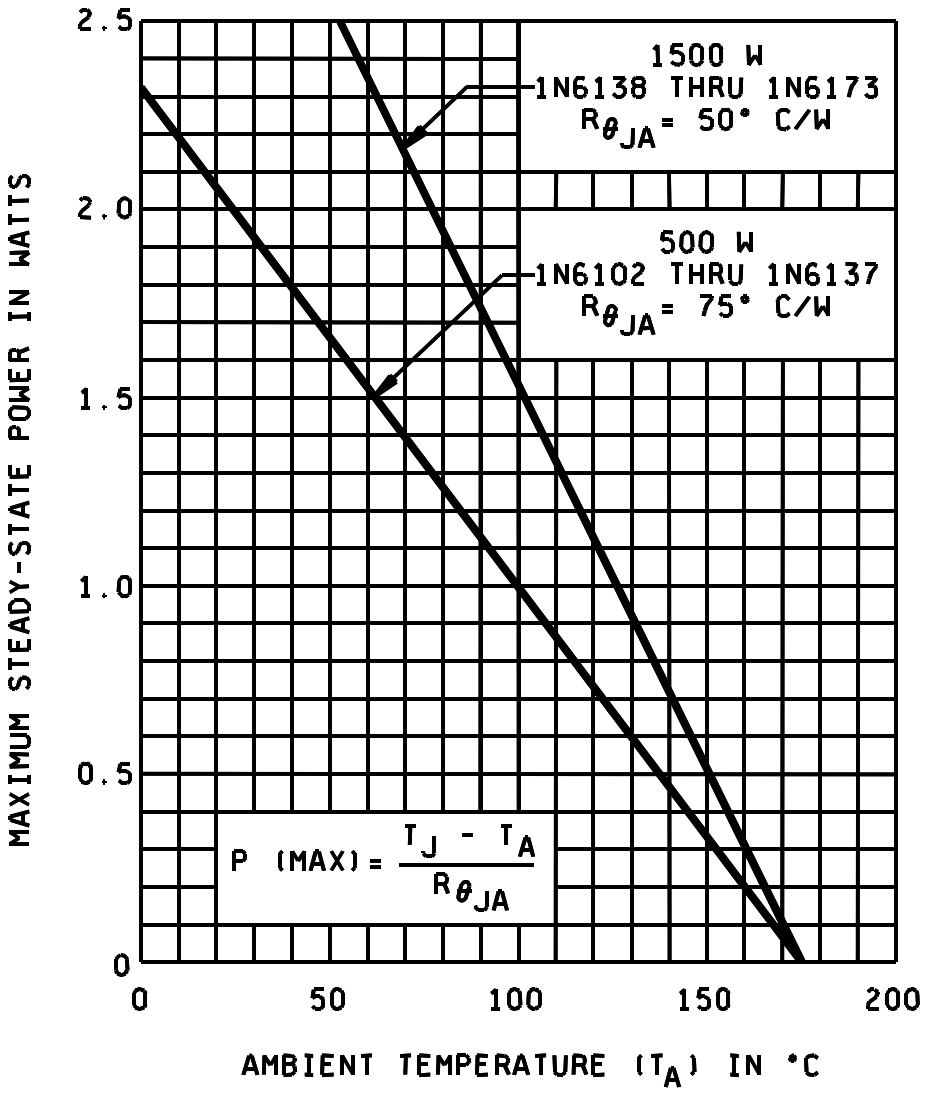
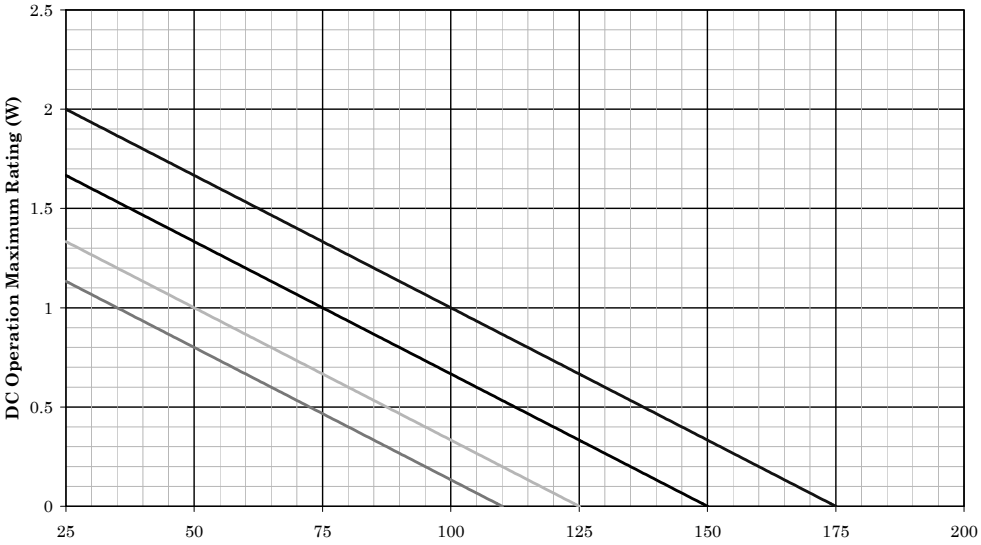



FIGURE 5. Steady-state derating curve for free-air mounting (not applicable to JANHC/JANKC die).

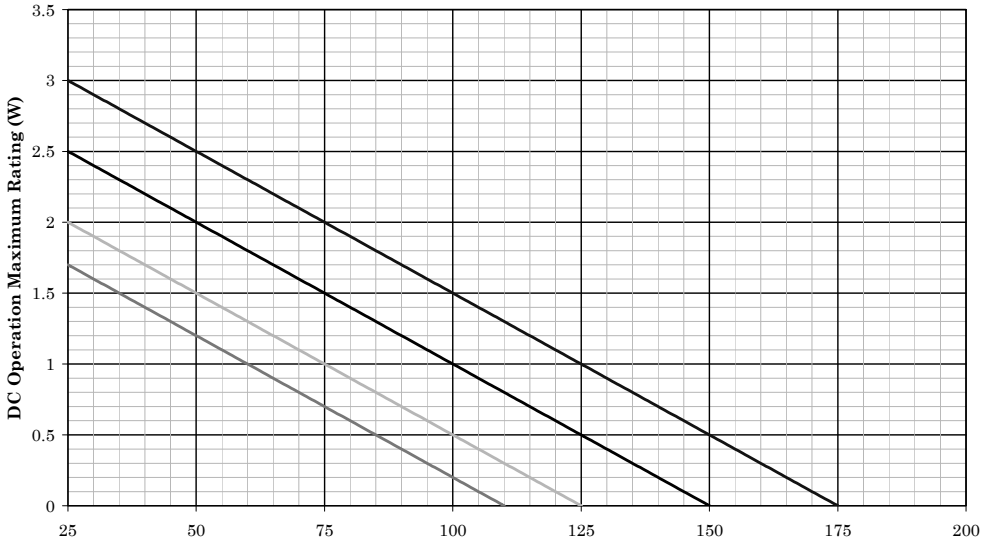
Temperature-Power Derating Curve
1N6102, A - 1N6137, A




DC Operation $T_A$ (°C) (Ambient)

Thermal Resistance Junction to Ambient = 75.0°C/W

Temperature-Power Derating Curve
1N6138, A - 1N6173, A




DC Operation $T_A$ (°C) (Ambient)

Thermal Resistance Junction to Ambient = 50.0°C/W

* FIGURE 6. Maximum power versus lead temperature (not applicable to JANHC/JANKC die).

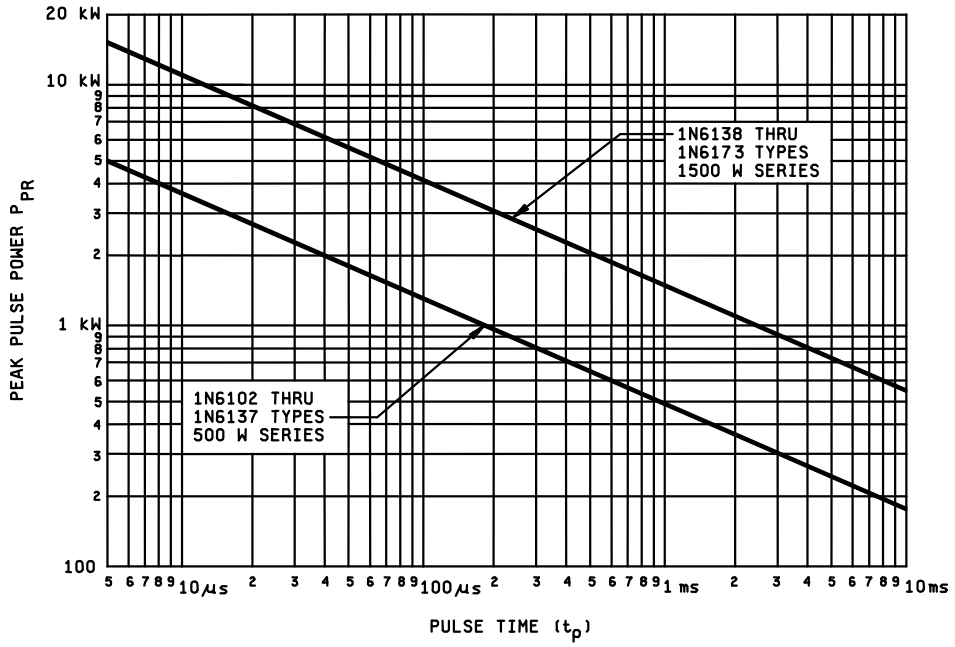



FIGURE 7. Peak pulse power versus pulse time.

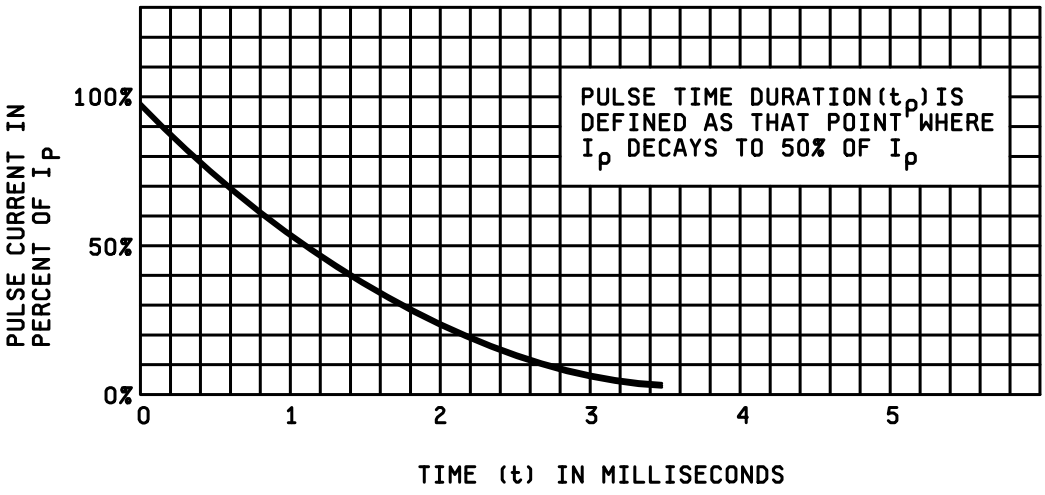
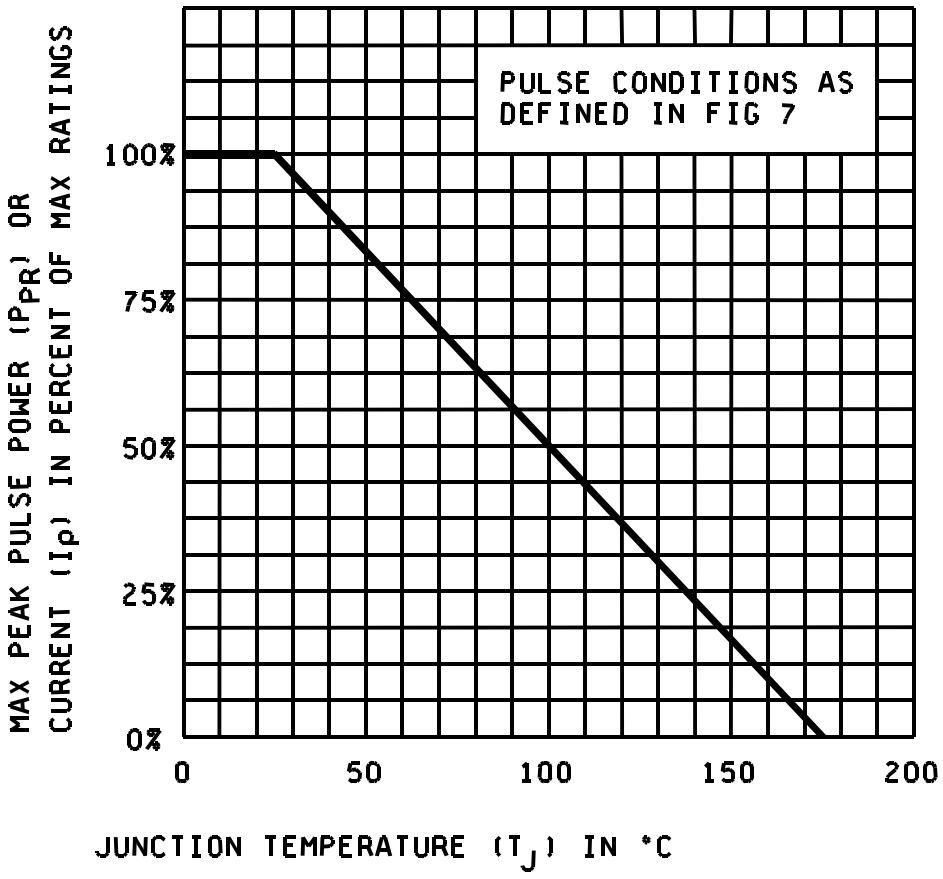



FIGURE 8. Pulse waveform.




The pulse derating curve of maximum peak pulse power versus junction temperature has been included for reference purposes only.

FIGURE 9. Pulse derating curve (not applicable to JANHC/JANKC die).

5. PACKAGING

* 5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When packaging of materiel is to be performed by DoD or in-house contractor personnel, these personnel need to contact the responsible packaging activity to ascertain packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activities within the Military Service or Defense Agency, or within the Military Service's system commands. Packaging data retrieval is available from the managing Military Department's or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

6. NOTES

* (This section contains information of a general or explanatory nature that may be helpful, but is not mandatory. The notes specified in MIL-PRF-19500 are applicable to this specification.)

* 6.1 Intended use. Semiconductors conforming to this specification are intended for original equipment design applications and logistic support of existing equipment.

* 6.2 Acquisition requirements. Acquisition documents should specify the following:

a. Title, number, and date of this specification.

b. Packaging requirements (see 5.1).

c. Lead finish (see 3.4.1).

d. Product assurance level and type designator.

e. Destructive physical analysis when requested.

* 6.3 Qualification. With respect to products requiring qualification, awards will be made only for products which are, at the time of award of contract, qualified for inclusion in Qualified Manufacturers List (QML 19500) whether or not such products have actually been so listed by that date. The attention of the contractors is called to these requirements, and manufacturers are urged to arrange to have the products that they propose to offer to the Federal Government tested for qualification in order that they may be eligible to be awarded contracts or orders for the products covered by this specification. Information pertaining to qualification of products may be obtained from Defense Supply Center, Columbus, ATTN: DSCC/VQE, P.O. Box 3990, Columbus, OH 43218-3990 or e-mail vqe.chief@dla.mil . An online listing of products qualified to this specification may be found in the Qualified Products Database (QPD) at http://assist.daps.dla.mil .

6.4 Suppliers of JANHC and JANKC die. The qualified JANHC and JANKC suppliers with the applicable letter version (example, JANHCA1N6102) will be identified on the QPL.

| JANHC and JANKC ordering information (1) (2) | | |
|---|---|---|
| PIN | Manufacturer CAGE | |
| | 14552 | 14099 |
| 1N6102 through 1N6137 | JANHCA1N6102 through JANHCA1N6137 | JANHCB1N6102 through JANHCB1N6137 |
| 1N6138 through 1N6173 | JANHCA1N6138 through JANHCA1N6173 | JANHCB1N6138 through JANHCB1N6173 |

(1) Applies to "A" suffix versions also.
(2) For JANKC level, replace "JANHC" prefix with "JANKC"

* 6.5 Changes from previous issue. The margins of this specification are marked with asterisks to indicate where changes from the previous issue were made. This was done as a convenience only and the Government assumes no liability whatsoever for any inaccuracies in these notations. Bidders and contractors are cautioned to evaluate the requirements of this document based on the entire content irrespective of the marginal notations and relationship to the last previous issue.

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(Project 5961-2007-099)

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